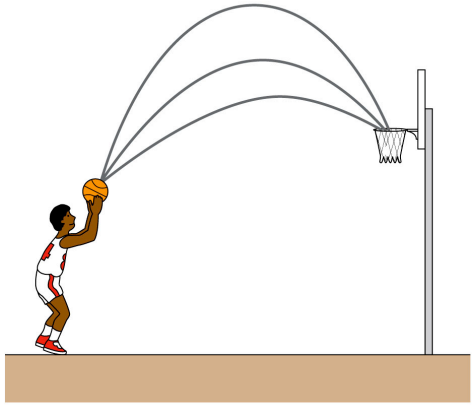
Projectile Motion: Shooting a basketball



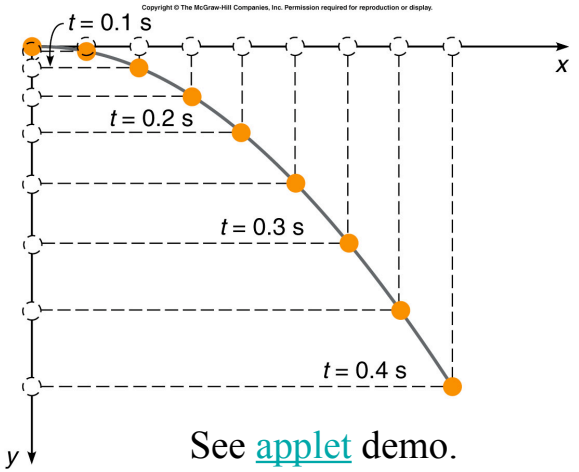
Projectile Motion

- A projectile is an object upon which the only force is gravity. Gravity acts to influence the vertical motion of the projectile, thus causing a vertical acceleration.
- The horizontal motion of the projectile is the result of the tendency of any object in motion to remain in motion at constant velocity. Due to the absence of horizontal forces, a projectile remains in motion with a constant horizontal velocity; horizontal forces are not required to keep a projectile moving horizontally.
- The only force acting upon a projectile is gravity!

Projectile – Free Fall Demo

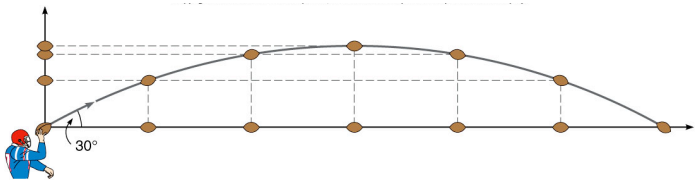
- Same vertical motion!

Projectile Motion



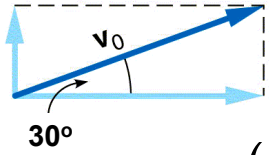
See applet demo.

Horizontal and Vertical Velocity



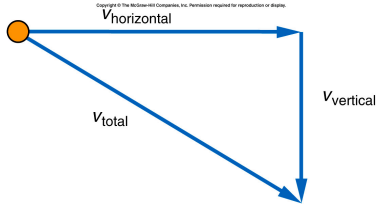
- A football is thrown with a velocity of 10m/s
- We can calculate the initial horizontal and vertical components of the velocity by using trigonometry

$$v_{0\ \text{vertical}} = v_0 \sin(30^0)$$



$$v_{0\ \text{horizontal}} = v_0 \cos(30^0)$$

Projectile



Velocity

$$v_{f\ \text{horizontal}} = v_{o\ \text{horizontal}}$$

$$v_{f\ \text{vertical}} = v_{o\ \text{vertical}} + gt$$

Position

$$x = v_{o\ \text{horizontal}}\, t$$

$$y = y_o + v_{o\ \text{vertical}}\, t + \frac{1}{2} g t^2$$